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DIRECT SURFACE MAGNETOMETRY WITH PHOTOEMISSION MAGNETIC X-RAY DICHROISM

James G. Tobin
Lawrence Livermore National Laboratory
Livermore, CA,94550

Element specific surface magnetometry remains a central goal of synchrotron radiation based studies of nanomagnetic structures. One appealing possibility is the combination of x-ray absorption dichroism measurements and the theoretical framework provided by the "sum rules[1]." Unfortunately, sum rule analyses are hampered by several limitations[2], including delocalization of the final state, multi-electronic phenomena, and the presence of surface dipoles. An alternative experiment, Magnetic X-Ray Dichroism in Photoelectron Spectroscopy, holds out promise based upon its elemental specificity, surface sensitivity and high resolution. Computational simulations by Tamura et al.[3], demonstrated the relationship between exchange and spin orbit splittings and experimental data of linear and circular dichroisms. Now we[4] have developed an analytical framework which allows for the direct extraction of core-level exchange splittings from circular and linear dichroic photoemission data. By extending a model initially proposed by Venus[5], it is possible to show a linear relation between normalized dichroism peaks in the experimental data and the underlying exchange splitting. Since it is reasonable to expect that exchange splittings and magnetic moments track together[6], this measurement thus becomes a powerful new tool for direct surface magnetometry, without recourse to time consuming and difficult spectral simulations. The theoretical derivation will be supported by high resolution linear and circular dichroism data collected at the Spectromicroscopy Facility of the Advanced Light Source[7,8].

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James G. Tobin
Lawrence Livermore National Laboratory
P.O. Box 808, L-357
Livermore, CA 94550
Telephone: 510-422-7247 • Fax: 510-423-7040
Email Tobin1@LLNL.gov